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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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11/21/2003

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EXAMINER

GEORGE, PATRICIA ANN

ART UNIT

PAPER NUMBER

1765

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
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3 MONTHS

04/19/2007

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary

Application No.

10/719,083

Applicant(s)

HWANG ET AL.

Examiner

Patricia A. George

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 25 January 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1, 2, 4 and 8 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1, 2, 4, 8 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1, 4, and 7-8 are rejected under 35 U.S.C. 103(a) over Meador et al.

(193-nm Multilayer Imaging Systems; Proc. SPIE Vol. 5039, June 2003, Advances in Resist Technology and Processing XX; Theodore H. Fedynyshyn; Ed.) in view of Takano et al. (6,692,892), and Fukushige et al. (6,190,824) evidenced by Wolf (Silicon Processing for the VLSI Era; pg. 408; lattice Press; 1986); Barclay et al., "Bilayer Technology for ArF and F₂ Lithography: The Development of Resists to Minimize Silicon Outgassing" Proc. SPIE, 2003, Vol. 5039, p. 453; and Andrieu et al. (6,261,721).

Meador et al. teaches a method of forming multiple layers of photoresist to pattern a structure using a photolithography process. See Figure 1, where Meador et al. illustrates a coating of BARC layer (i.e. the etching mask layer) is patterned and used for masking the area of the substrate undesirable to etch in the final CF₄ etch into the substrate. Meador et al. also teaches the patterned BARC serves as the etching mask

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during the transfer of the image to the substrate in section 1. Introduction. This illustration is written on coating an etching masking layer on an underlying layer, as in applicants' step a). Meador et al. illustrates coating, onto the etching mask layer, an EML material (referred to as M. layer in Figure 1). Because Meador et al teaches a plurality of EML's for the sake of this examination, examiner will select use of EML VI. As to the composition of the EML VI Meador et al. teaches: 11.1 wt % of silicon is included in the polymer (see Table 1, and the first sentence of section 3.1.1.); and 9 parts of photoresist (see section 3.1.3). Wolf provides evidence that the function of photoresist is well established and perform two roles: first it must response to exposing radiation such a way that a mask image can be replicated in the resist; and second the remaining areas of resist must protect the underlying substrate during subsequent processing.

It would have been obvious to one of ordinary skill in the art at the time of invention was made, EML VI, is Meador et al.'s, is a photoresist film, as in applicants' limitation b), because in composition it is 9 parts photoresist, and therefore has the capability to provide the two functional roles of photoresist, as identified by Wolf.

Meador et al. teaches forming an underlayer pattern by using the etch mask pattern which was formed by etching with the photoresist film pattern (see fig. 1).

Meador et al. does not teach forming the gas protection film comprising a water-soluble polymer material on the photoresist film and the gas protection film absorbing silicon gas generated from the photoresist film during an exposure process as in claim

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1; or the steps of spin coating said material on the resultant surface followed by baking the said composition, as in claim 8.

Takano et al. teaches use of an ARC that provides excellent profile even when an anti-reflective coating is formed by spin coating (col. 3, line 45) on a resist material (i.e. resultant surface), and baked (see example 1). Takano et al. teach the water soluble ARC film comprise a resist polymer, polyvinyl pyrrolidone, (see abstract and col.2, line 48) (i.e. micro-porous bonding polymer), one of many functional resist polymers on a list in applicants' own specification.

Since the reference of Takano et al. teaches using the similar resist material, water-soluble ARC film comprise a resist polymer (i.e. micro-porous bonding polymer), in the same configuration, over a resist material, it would appear that the same function, gas protection film absorbing silicon gas generated from the photoresist film during an exposure process would intrinsically be produced (see references noted in Conclusion under prior art made of record and not relied upon).

It would have been obvious to one of ordinary skill in the art at the time of invention was made, to include the step of using a gas protection film comprising a water-soluble ARC film comprising functional resist polymers (i.e. micro-porous bonding polymers) on the photoresist film, as Takano et al., when forming the photoresist pattern, as Meador, because Takano teaches use of the material provides excellent profile even when an formed by coating on a resist.

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Meador fails to teach applicants specifically claimed resist polymers selected from the group containing copolymers of methyl methacrylate and acrylic acid; and copolymers of methyl acrylate and acrylic acid; and mixtures thereof, as in claim 1.

Andrieu et al. (6,261,721) provides evidence that micro-porous bonding polymers such as polymethyl methacrylate (PMMA), polymethyl acrylate, belong to the same group as Takano's polymer, polyvinylpyrrolidone.

Fukushige et al. (6,190,824) teaches binding (i.e. bonding) polymers used to prepare photoresists compositions, such as copolymers of: polymethyl methacrylate (PMMA), polymethyl acrylate, polyacrylic acid, and mixtures thereof, as applicants specific limitation on claim 1.

It would have been obvious to one of ordinary skill in the art at the time of invention was made, to modify the resist system invention of Meador et al. to include copolymers of methyl methacrylate and acrylic acid; and copolymers of methyl acrylate and acrylic acid; and mixtures thereof, as applicants' limitation of claim 1, because Andrieu et al. (6,261,721) provides evidence that micro-porous bonding polymers such as polymethyl methacrylate (PMMA), polymethyl acrylate, belong to the same group as Takano's polymer, polyvinylpyrrolidone and Fukushige et al. (6,190,824) teaches said binding (i.e. bonding) polymers are known to be functional and effective when used in photoresist composition. It has been held that it is cost saving to used products known to be effective and function. Further it would have been obvious to one of ordinary skill in the art at the time of invention was made, that polymers, as Fukushige, would provide the same function a step of using a gas protection film comprising a water-soluble film,

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as applicants specifically claimed limitations, because in absence of unexpected results it has been held that similar materials provide similar functions.

As for claims 4, and 7 Meador et al. anticipated the photo resist composition is for a process employing a light source of 193-nm Imaging Systems (ti.).

As for claim 8, Meador et al. anticipated spin coating and hot plate baking coated compositions (ab. I.3).

Claim Rejections - 35 USC § 103

Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Meador et al., Takano et al., and Fukushige et al., as applied to claims 1, 4, and 6-9 above, further in view of Shibata et al. of Material and Process Development of Tri-level Resist System in KrF and ArF Lithography [Proc. SPIE Vol. 4690, July 2002, Advances in Resist Technology and Processing XIX; Theodore H. Fedynyshyn; Ed.].

The modified invention of Meador et al. fails to teach the use of KrF photo resists, as in claim 2.

Shibata et al. teaches etching mask layers are formed by spin coating a KrF photo resist layer system (ab., I.7-8), as in claim 2.

It would have been obvious to one of ordinary skill in the art at the time of invention was made, to include the use of KrF resists, as taught by Shibata, when forming the resist system of, Meador, because Shibata teaches the KrF resist system

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provides greater excellent dry etch resistance because of the high carbon (90%) content (see abstract).

Response to Arguments

Examiner agree with applicants' remark, on page 5, toward the art rejection of 10/25/2006 not disclosing the amended water soluble polymer of the gas protection film, of claim 1, therefore new ground of rejection is offered above.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Patricia A. George whose telephone number is (571)272-5955. The examiner can normally be reached on Tues. – Sat. between 7:00am and 4:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on (571)272-1465. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Patricia A George
Examiner
Art Unit 1765

PAG 0407

NADINE NORTON
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ART UNIT
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